Project Title: Nitrogen Management Training for Certified Crop Advisors

Project Leaders:

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CDFA Funding Request: $359,616

Agreement Manager:

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Justification:

Problem:
Recent studies have increased our awareness of agriculture's role in groundwater degradation. Nitrates from fertilizers are of primary concern. While current attention is focused on nitrate in the Tulare Basin and Salinas Valley, evidence suggests that this is an issue of statewide concern.

FREP Mission and Research Priorities:
Research and education on fertilizer use and externalities is a primary mission of the FREP program. This project will focus on the educational aspects of fertilizer and manure management. Additional research to support the curriculum development will also be carried out.

Impact:
This project has the potential to improve fertilizer use, manure management, and irrigation across the state. The trainings will inform California Certified Crop Advisors (CCAs) about how they can help farmers improve profitability while also improving environmental and public health outcomes.

Long term solutions
By providing training for CCAs, we will be helping to put California's farmers on the path to more profitable and environmentally sound agricultural practices. This should lead to reductions in nitrate leaching to groundwater aquifers.

Contribution to Knowledge Base
This project will gather existing information on fertilizer use (specifically nitrogen but other elements must be considered as well), manure use, and irrigation. The information will be assembled into a training program for CCAs. Additional information will be generated to help cover gaps in our knowledge base.

Grower User
As CCAs often advise growers on their fertilizer, manure, and irrigation practices, this training will impact growers. In addition, some growers will be required to have nitrogen management plans that will certified by CCAs. This training will allow CCAs to sign these plans.

Objectives:

The Nitrogen Management Training and Certification Program is a joint effort between the California Department of Food and Agriculture; University of California, Agricultural and Natural Resources (UC ANR); California Certified Crop Advisor Program; California Association of Pest Control Advisors (CAPCA); and the Regional Water Boards to develop and implement a voluntary nitrogen management curriculum specifically targeted for California Certified Crop Advisors (CCAs). The effort is being coordinated by the UC California Institute for Water Resources (UC CIWR). The curriculum will address the management of nitrates from plant nutrients to reduce unintentional emissions in waters throughout the state.

The goal of the program is to facilitate CCAs understanding of sound nitrogen management practices and increase their ability to make informed recommendations to growers, thereby improving environmental performance relative to nitrogen management for crop production. An outline of the proposed curriculum is below:

Curriculum:

The following curriculum outline assumes that regional meetings will be held in five locations in the Sacramento Valley, San Joaquin Valley, and Central Coast. All participants attend the main session, and then concurrent sessions will be held on permanent crop and annual crop issues.

Main session:

1. Objectives of the course:
   A. Opportunities to enhance economic and environmental benefits through improved management of agricultural use of nitrogen and irrigation water. Overview of what we know about nitrate impairment of surface water (coast only) and groundwater (all regions), and the relative contribution of agriculture to those impairments.
   B. Region-specific discussion of local soil and hydrologic conditions as they relate to groundwater vulnerability and nitrate contamination. ILRP action to reduce nitrate loading to groundwater; the proposed / enacted requirements for nitrogen (N) management plans; and Certified Crop Advisor (CCA) signoff requirements. 45 minutes total.

2. Quantify the relative scale of N loss through denitrification / volatilization / leaching, and the factors that contribute to N losses from soils. Discuss the dynamics of soil N mineralization, and how it should factor into N management. Representative permanent crop and annual crop systems will be contrasted to point out how patterns of crop N uptake, fertilizer application, and water flux (irrigation and rain) govern potential N loss to the environment. In-depth discussion of nitrogen cycles in crop production systems. 90 minutes total.

3. Mineral fertilizer N forms (including slow release fertilizers), soil reactions, and mobility; environmental (temperature/moisture) effects on those transformations. Contribution of irrigation sources nitrogen. Characteristics of manures, composts, cover crops, and other plant residues, and their N mineralization potential. 45 minutes.

4. Connection of irrigation to N management. Discuss irrigation scheduling and irrigation system design and operation, identifying the practical limit of irrigation efficiency, common errors that result in lower uniformity or efficiency than should be possible. Give examples of the magnitude of possible NO_3-N leaching losses. Discuss how soil characteristics contribute to managing leaching requirements, and how 'strategic' leaching might be done to minimize NO_3-N loss. 60 minutes.

5. Nitrogen budgeting – matching supply with demand. Introduction to the idea of developing an N budget template and what field-specific factors, for annual and permanent crops, should be considered. 45 minutes. (Note – this is fleshed out in the concurrent sessions.)

6. Provide an overview of available tools and resources e.g., CropManage, FREP database, yield monitoring, variable rate application, soil mapping, and aerial imaging. 30 minutes.

Concurrent sessions:

Annual crops:

A.1. For each crop type (i.e. leafy vegetables vs. berries in the Central Coast) critically examine current practices to highlight what practices lead to high N loss potential, and when (seasonally) those losses occur. 30 minutes.

A.2. Discussion of BMPs to address these weaknesses in the current system. This discussion would be crop specific; depending on the cropping system the emphasis could be on soil testing, tissue analysis, irrigation upgrades, fertilizer timing, etc. Tools for N budgeting. Discussion of the methods available and constraints of plant, soil and irrigation water monitoring: Sampling protocols, sampling designs, tools, installations and interpretation. Discussion of temporal and spatial field variability and approaches required to optimize monitoring and management responses. 90 minutes total.

A.3. N management planning exercise
Cropping scenarios that highlight differences in crop rotation, yield goals, soils, crops and irrigation methods will be provided. Participants will break into groups and be tasked with developing an N management template for two contrasting scenarios: Feedback and discussion. 90 minutes, multiple instructors.

Permanent crops:

P.1. For each crop type (e.g., citrus trees vs. grapes) critically examine current practices to highlight what practices lead to high N loss potential, and when (seasonally) those losses occur. 30 minutes.

P.2. Discussion of BMPs to address weaknesses in the current system: The discussion would be crop specific; depending on the cropping system the emphasis could be on soil testing, tissue analysis, irrigation upgrades, fertilizer timing, etc. [Tools for N budgeting]. Discussion of the methods available and constraints of plant, soil and irrigation water monitoring: Sampling protocols, sampling designs, tools, installations and interpretation. Discussion of temporal and spatial field variability and approaches required to optimize monitoring and management responses. 90 minutes total.

P.3. N management planning exercise
Cropping scenarios that highlight differences in yield goals, soils, crops and irrigation methods will be provided. Participants will break into groups and be tasked with developing an N management template for two contrasting scenarios: Feedback and discussion. Multiple instructors, 90 minutes.

Work Plan:

The project will involve curriculum development, website development and maintenance, trainings and publications. The project will be carried out in 2 phases with deliverables provided in stages.

Phase I: (August 1, 2013 – December 31, 2014)

This phase involves curriculum development and an initial round of trainings.

Curriculum Development:

The curriculum will be developed by small teams (5-15 people) by section as described above. A team leader will organize each team. Participants will be involved in curriculum

development with in-person meetings in Davis and subsequent collaboration taking place largely via conference call and email.

Deliverable 1: The draft curriculum in the form of PowerPoint presentations with speakers' notes and references to important material will be delivered by October 31, 2013.

Deliverable 2: The final curriculum along with a website for course reference will be delivered by January 6, 2014.

Trainings Sessions:

Deliverable 3: We anticipate that this course will be two days in length. Team members will lead training sessions. Logistics for the training sessions will be provided by the California Association of Pest Control Advisors (CAPCA). The proposed dates and locations for the trainings are as follows:

1. Modesto – first or second week of January
2. Tulare – third or fourth week of January
3. Fresno – fourth week of February
4. Salinas – first week of March
5. Sacramento Valley – TBD

Phase II: (October 1, 2014 – December 31, 2016)

This phase involves curriculum modification, a second round of trainings, and development of publications and other outputs from the curriculum that can be used for additional outreach.

Curriculum Modification
The curriculum used in the first round of trainings will be reviewed based upon feedback from those trainings. Modifications to the curriculum will be considered and implemented.

Deliverable 4: A final new curriculum will be delivered by January 15, 2015.

Training Sessions:

Deliverable 5: Three additional training sessions will be held in 2015. Locations and times will be based on need and will be determined in the late spring of 2014. The website will be updated regularly during this time.

Publications:

Deliverables 6-9: A total of four publications will be created from the training materials, lessons learned from the training sessions and from additional research. The exact form of these publications is not yet determined and will depend on subject matter material and intended audience. The current intent is to produce publications for the UC ANR peer reviewed 8000 series. Depending on the subject matter and level of detail, other possible outlets include peer reviewed journals and non-peer reviewed fact sheets and reports.

Deliverable timeline:

	Activity and Deliverable	Start Date	End Date
D.1	Draft Curriculum Development	August 1, 2013	October 31, 2013
D.2	Final Curriculum Development	November 1 2013	January 6, 2014
D.2	Website Development	August 1, 2013	January 6, 2014
D.3	Website Maintenance	January 7, 2014	December 31, 2016
D.3	Round 1A of trainings	January 7, 2014	March 15, 2014
D.3	Round 1B of trainings	September 1, 2014	December 31, 2014
D.4	Curriculum modification	October 1, 2014	January 15, 2015
D.5	Round 2 of trainings	January 15, 2015	December 31, 2015
D.6 - 9	Publications	January 7, 2014	December 31, 2016

Project Management, Evaluation, and Outreach:

Management
Overall project management will be provided by the UC CIWR. This will involved coordinating curriculum development teams, editing of curriculum, creation of accompanying website, coordination with CDFA and the Water Boards, coordination with CAPCA for training logistics.

Management of the curriculum and training will be carried out by the project steering committee (see list of Project Leaders on cover page). This team will meet regularly with CDFA and other partners via conference call and in-person. Leads from this team will organize the sub-teams that will create the curriculum as outlined above. These leads will also assist in organizing the training sessions.

Evaluation
Participants of each training session will be asked to fill our evaluation forms that will be used to improve the trainings. We will also track usage of the website to evaluate its effectiveness.

Outreach
Years 1 and 2 of the project will have direct outreach to CCAs through trainings. Publications and reports in year 3 will be used in farm field days and will be promoted through the UC ANR publications and communications unit.

Budget Narrative:
The budget for this project covers the development and delivery of curriculum, trainings, and publications.

Operating Expenses:

Travel:
Travel for project management, steering committee meetings, curriculum development team meetings, and training sessions are listed in the budget. Travelers include the project management team, steering committee members, curriculum development team members, and those carrying out the actual trainings. Travel expenses are calculated at the rates specified by the California Department of Personnel Administration. Details are listed below:

Travel for each curriculum development team: 2 meetings in Davis per team of 5 people (may include overnight for 1 night)	$150/person	5 people x 6 teams + 10 people X 2 teams	$15,000
Travel for presenters to the 5 training sessions (will require 2 overnights per session)	$100 hotel/night, $34 Meals, x 2 days plus $6 Incidentals and $130 mileage	11 instructors per training + 2 CIWR support	$26,260
Travel for steering committee meetings	$130/person + $250 for lunch per meeting	3 people for 4 meetings	$2,560
Travel for CIWR team to manage project as necessary (steering committee meetings, CDFA meetings, technical support meetings…)	$170/trip	12	$2,040
Travel for presenters to the 3 training sessions (will require 2 overnights per session)	$100 hotel/night, $34 Meals, x 2 days plus $6 Incidentals and $130 mileage	11 instructors per training + 2 CIWR support	$15,756

Other Expenses:
Costs for the development and delivery of each deliverable are listed below:

Deliverables	
Draft Curriculum Development	$105,240
Final Curriculum Development	$33,060
Website Development	$15,000
Website Maintenance	$8,000
Round 1A of trainings	$28,000
Round 1B of trainings	$7,000
Curriculum modification	$27,700
Round 2 of trainings	$21,000
Publications	$53,000

Budget Template:

The budget for the curriculum development, website development and maintenance, trainings, and publications is below:

Nitrogen Management Training and Certification Program For Certified Crop Advisors

Draft budget - Phase 1:

	Costs	**Participants/units**	**Cost**
Travel for each curriculum development team: 2 meetings in Davis per team of 5 people (may include overnight for 1 night)	$150/person	5 people x 6 teams + 10 people X 2 teams	$15,000
Travel for presenters to the 5 training sessions (will require 2 overnights per session)	$100 hotel/night, $34 Meals, x 2 days plus $6 Incidentals and $130 mileage	11 speakers per training + 2 CIWR support	$26,260
Travel for steering committee meetings	$130/person + $250 for lunch per meeting	3 people for 4 meetings	$2,560
Travel for CIWR team to manage project as necessary (steering committee meetings, CDFA meetings, technical support meetings…)	$170/trip	12	$2,040
Travel Total			**$45,860**
Deliverables			
Draft Curriculum Development			$105,240
Final Curriculum Development			$33,060
Website Development			$15,000
Website Maintenance			$8,000
Round 1A of trainings			$28,000
Round 1B of trainings			$7,000

Total	$242,160

Draft budget - Phase 2:

	Costs	Participants/units	Cost
Travel for presenters to the 3 training sessions (will require 2 overnights per session)	$100 hotel/night, $34 Meals, x 2 days plus $6 Incidentals and $130 mileage	11 people per training + 2 CIWR support	$15,756
Deliverables			
Curriculum modification			$27,700
Round 2 of trainings			$21,000
Publications			$53,000
		Total	$117,456

Total	**$359,616**